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Transport Infrastructure Ireland

## TII Publications



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# Notes for Guidance on the Specification for Electrical Work for Road Lighting and Traffic Signs

**CC-GSW-01400**  
May 2019

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## TII Publications




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<b>Activity:</b>	Construction & Commissioning (CC)
<b>Stream:</b>	Guidance on Specification for Works (GSW)
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**Updates to TII Publications resulting in changes to****Notes for Guidance on the Specification for Electrical Works for Road Lighting and Traffic  
Signs CC-GSW-01400****Date:** May 2019**Page No:** General**Section No:** General**Amendment Details:**

Incorporation of:

New format to match TII format (from UK SHW format);  
Updating of referencing to TII publications;  
Incorporation of new lighting technology specification (e.g. LED);  
Removal of older lamp technologies such as SOX which does not meet current EU standards;  
General updating across the document to reflect current best practice etc. when implementing  
lighting on the National Road network.

**Date:** October 2019**Page No:** General**Section No:** General**Amendment Details:**

Document Title has been updated from "Notes for Guidance on the Specification for Road Works  
NG 1400 – Electrical Work for Road Lighting and Traffic Signs" to "Notes for Guidance on the  
Specification for Electrical Work for Road Lighting and Traffic Signs"

Sample Appendix 14/5 has been added.

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# **1. General**

ESB Networks should be consulted on requirements for the electrical source supply. This should include the rating of the supply in kVA and the nominal supply voltage and tolerances.

At the design stage the termination of the private circuit cable in lighting units and feeder pillars should be requested to avoid delay in connecting the ESB supply.

Attention is drawn to the 'Code of Practice for Electrical Safety in Highway Electrical Operations' available from the Institution of Lighting Professionals (ILP).

The term 'network' is defined to ensure that testing to CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 24 is not applied to Lighting Units and feeder pillars where it could cause damage to equipment.

Where cable owned by the electricity supplier is utilised for the power supply to individual locations and the Contractor is not required to provide and install cables, the reference to 'network' is not applicable.



## **2. Site Records**

'As-built' drawings shall be produced by the Contractor. Where required the 'As-Built' drawings shall include inserts to a larger scale when layouts are complex. The requirements should be described in Appendix 14/1 for road lighting and traffic signs and for electrical schematics for private cable networks. If it is considered practical, any motorway communication details should also be added, otherwise these requirements should be included in Appendix 15/1 (see CC-GSW-01500 – Notes for Guidance on the Specification for Road Works Series NG 1500 - Traffic Control and Communications – Section 4).

During construction, the longitudinal locational measurements may have to be related initially to chainages and converted to refer to permanent road features such as bridge abutments, or marker posts when these are defined.

The production of accurate daily site records, which should be on a form approved by the Employer's Representative, is of assistance in the preparation and checking of the 'as-built' drawings, and more particularly for the location of underground cables etc. and for fault-finding in the interval between the issue of a certificate of completion and the availability of 'as- built' drawings.

Other requirements for 'As-Built' information is identified in CC-CMG-04001 – Preparation and Delivery Requirements for As-Built Records.

### **3. Location of Lighting Units and Feeder Pillars**

The approximate position of all Lighting Units and feeder pillars should be indicated on the Drawings and differentiation made between each type of Lighting Unit and feeder pillar. Location of overhead power lines should also be indicated to ensure that minimum safety clearances are maintained. Appendix 14/2 can be used to describe the location and type of all Lighting Units and feeder pillars. For example, the Appendix can be used to show the set-back of lighting columns from the kerb or the edge of carriageway in a tabular form.

## **4. Change of Lighting Arrangements**

New Lighting Units should not normally be switched on and left in operation, apart from testing, before the road is opened to traffic and they are liable to mislead and confuse drivers particularly where temporary diversion routes have been introduced or a newly completed road has not been opened to traffic.

Existing Lighting Units should not be switched off until the new permanent (or temporary Lighting Units) are operational.

## 5. Temporary Lighting

Appendix 14/3 should include details of the following:

- i. Employer's Representative's requirements for the provision of temporary Lighting Units; and
- ii. Design and specification requirements for any temporary lighting which the Contractor may require in the execution of the Contract.

## **6. Radio Interference**

Not Used.

## **7. Road Lighting Luminaires**

Any particular requirements should be listed in Appendix 14/4 giving details of glare control, light source and wattage, whether fitted with integral gear/driver and whether to have higher IP rating. Luminaires not to be fitted with photo-electric control unit sockets should be included in the Appendix. If two part PECUs are specified, PECU sockets will not be required in the luminaires but alternative fixings should be detailed.

Appendix 12/1 should state which signs are to be lit by internal illumination and which by overhead or free-standing luminaires.

If fuses are required in any integral gear compartment their rating should be specified in Appendix 14/4.

The procedure regarding aesthetic approval is given in CC-SPW-01300 – Specification for Road Lighting Columns and Brackets and CCTV Masts – Section 2.

## **8. Traffic Sign Luminaries**

Particular requirements for Lit Sign Units should be given in Appendix 14/5.

## **9. Lighting Emitting Diodes (LED) Light Sources**

All LED Light Sources and their supply are subject to the Electrical Regulations maintained by the National Standards Authority of Ireland.

The luminaires shall be tested and approved by an independent 3rd Party ENEC (European Norms Electrical Certification) national Certification Body and awarded the ENEC mark in accordance with CENELEC Operational Document CIG 021.

Sockets to be installed on the luminaire that are designed to facilitate switching, central management functions and sensors shall be subject to the approval of the Employers Representative.

LED Light Sources selected for a project should include product data sheets attached to Appendix 14/4. The manufacturer shall be accredited to the following standards at the time of tender:

- i. IS EN IEC/ISO 17025, General requirements for the competence of testing and calibration laboratories;
- ii. IS EN ISO 9001, Quality management systems. Requirements;
- iii. IS EN ISO 14001, Environmental management systems. Requirements with guidance for use; and
- iv. Any additional requirements under SEAI Triple E certification.



## **10. Lighting Emitting Diodes (LED) Drivers**

The LED driver shall include a communications protocol to communicate with a CMS system, as identified in Appendix 14/4, it shall be an open standard protocol, allowing for interoperability between various systems and end devices. The Employer's Representative will review the proposed design and communication protocol prior to approval.

The LED driver shall be segregated from the LED array within the luminaire and shall have a minimum lifespan of 100,000 hours.

## 11. Central Management Systems (CMS)

The requirements for Central Management Systems will be as described in Appendix 14/4.

CMS functionality shall include as a minimum:

- i. Capable of controlling a minimum of 100,000 assets:
- ii. Secure Open Protocol:
- iii. Real time status of individual light assets including fault logging and reporting;
- iv. Accurate Revenue Grade Meter System;
- v. Low Power Consumption;
- vi. Support both LED and HID light sources;
- vii. Grouping of light sources;
- viii. Intuitive Software Interface;
- ix. Plug and Play Apparatus;
- x. Capability for Multiple Timing and Dimming profiles for individual and grouped assets;
- xi. Include a map-based interface with GPS plotting;
- xii. Reporting with data exporting function;
- xiii. Application Programming Interface Integration (API); and
- xiv. Remote System Upgrade Capability.

### Communications

A CMS system shall support both fixed and wireless communication types and be able to handle multiple connections at once, to avoid bottle-necks during communications with light sources. The infrastructure will be assessed by the Employers representative on a case-by-case basis.

### Protocols

The CMS shall be support open standard communications protocols, allowing for interoperability between various systems and end devices. This includes communication at system level, such as an Application Programming Interface (API), and to the end-device, enabling the end-devices to communicate with other system vendors.

The protocols will be assessed by the Employers representative on a case-by-case basis.

## **12. Dimming**

The requirements for Dimming are to be detailed in Appendix 14/4.

## **13. Photo-electric Control Units (PECUs)**

Photo-electric control units may be one part or two part. Where ballasts or drivers are incorporated within luminaires, one part units are more appropriate.

When luminaires are mounted in pairs on twin arm brackets, the use of shorting plugs is not normally practicable with two part units. The alternative with two part units is the separate control of each luminaire.

Shorting plugs (i.e. dummy PECUs) are normally placed in all lanterns above a particular carriageway; their position in contiguous lighting should be considered in relation to planned maintenance access.

The switching level and differential of the PECU should be specified in Appendix 14/4.

PECU sockets shall be either 7 pin NEMA or System Ready (SR) and should be stated in Appendix 14/4.

## 14. Time Switches

Photo-electric cells are preferred but where their use is not practical, astral capable time switches with an appropriately rated contactor may be specified in Appendix 14/4.

The switching capacity should be chosen to accord with that for PECUs in BS 5972.

## **15. High Intensity Discharge (HID) Lighting**

HID Lamp type and wattage should usually be listed with the associated luminaire.

### **15.1 Ballasts**

If ballasts are for other than 230 V operation this should be specified in Appendix 14/4.

### **15.2 Ignitors for Discharge Lamps**

Ignitors integrated with lamps may be necessary as an alternative where particular circumstances require. Their use should be approved by the Employer's Representative.

## **16. Cut-outs, Fuse Holders, Fuses and Miniature Circuit Breakers (MCBs)**

The rating of fuses and MCBs in lighting units and feeder pillars etc. should be specified in Appendix 14/4.

Proper discrimination in their operation should be ensured to avoid unnecessary interruption of supplies.

Where service cut-outs are provided by the electricity supplier, sufficient space should be left by the Contractor in Lighting Units and feeder pillars to accommodate them.

The type of cut-out, fuse holder and MCB required will be dependent upon the cabling system and cable size and should be specified in Appendix 14/4.

All cut-outs and fuse holders shall provide double-pole isolation.

The class of MCB will depend on the maximum prospective fault current and should be specified in Appendix 14/4.

## **17. Base Compartment Fixing Arrangement**

Not Used.



## 18. Feeder Pillars

ESB Networks may require an undertaking to pay for energy before agreeing to provide a supply, the Employer's Representative should normally make arrangements with the supplier for the provision of services to Lighting Units and feeder pillars although it remains the Contractor's responsibility to ensure that supplies are available to meet programme.

The material and construction of the feeder pillar case, and the finished treatment should be described in Appendix 14/4.

The equipment required in the feeder pillar should be specified in Appendix 14/4 as follows:

- i. Mounting facilities for the electricity supplier's cable cut-out;
- ii. Terminations, glands, trunking, method of fixing and sizes for cables and wiring;
- iii. Distribution boards fitted with MCBs or fuses for the outgoing cables. The maximum breaking capacity of the MCB should be not less than the prospective maximum short circuit current;
- iv. An earth stud with washers and clamping nuts;
- v. Circuit diagrams and labelling showing details of interconnection of equipment and the connection of cables to and from the pillar; all indelibly drawn or engraved on a material not subject to damage by the environment or normal use;
- vi. When required, a thermostatically controlled 60 watt heater should be mounted at the bottom of the base board;
- vii. When required, a bulkhead style LED lighting unit mounted towards the roof of the feeder pillar to provide light for inspection purposes at night; and
- viii. When required, a 13A rated socket to provide power to portable equipment.

Where the Employer's Representative requires the supply of keys to the pillar door the requirements should be specified in Appendix 14/4.

Where the group control of Road Lighting Units is preferred, the requirements should be specified in Appendix 14/4.

A drawing of each type of pillar should be provided showing:

- i. The desired layout of the equipment. (It should be noted that the variety of suitable equipment available may make it impracticable to define specific sizes);
- ii. Internal wiring details, including main earth connections as required by National Standards Authority of Ireland for the type of system of which the installation is to form a part, to take account of the requirements of the electricity supplier; and
- iii. The method of sealing the base of the pillar.

The Contractor should be required to detail any variation from the feeder pillar layout described.

## **19. Wiring**

Requirements for component layout and wiring should be detailed on typical schematic drawings; guidance is given in CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 1. The Contractor is responsible for preparing detailed drawings for approval by the Employer’s Representative.

If the wiring specified above is to be altered, Contract-specific requirements should be described in Appendix 14/4.

## **20. Earthing**

Requirements for earthing arrangements should be detailed on typical schematic drawings.

The ET 101: National Rules for Electrical Installations specifies the electrical requirements for safety and reference should be made to those Regulations when there is doubt on the extent of bonding and of earth electrode provision required.

When a TN-C-S service is provided by the electricity supplier, earth electrodes should be installed in accordance with the supplier's requirements, which should be given in Appendix 14/4 and with the requirements of ET 101 National Rules for Electrical Installations.

## **21. Underground and Ducted Cables**

If the cable type required in CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Sections 20 and 21 is to be varied (e.g. concentric or split concentric) Contract-specific requirements should be described in Appendix 14/4.

Cable type conductors, sizes and materials should be shown on the Drawings, cross-referenced in Appendix 14/4 related to cable runs. It should be made clear where cables are to be laid in troughs, or in ducts, where they are to be attached to structures, and where additional protection and support is required. Where ducts are required these should comply with CC-SPW-00500 - Specification for Road Works Series 500 - Drainage and Service Ducts – Section 1 unless there are any particular requirements, which should be listed in Appendix 5/2. The Drawings should show that cables have a minimum clearance of 500 mm from safety barrier foundations.

Cable supports should be provided as necessary where cables cross draw pit chambers etc. so as to maintain a maximum of 450 mm between supports. Where cables are laid in public footpaths and in other cases where additional protection is required, cable covers should be shown on the Drawings, cross-referenced in Appendix 14/4. Cover sizes should be 150 x 225 mm for one cable not exceeding 50 mm diameter and 225 x 300 mm for one cable exceeding 50 mm diameter or two not exceeding 37 mm each.

The minimum requirement for depth of cover on cables are those specified by the National Rules for Electrical Installations.

Where existing buried cables are required to be removed, details should be included in Appendix 2/2 and the advice given in CC-GSW-00200 - Notes for Guidance on the Specification for Road Works Series NG 200 - Site Clearance – Section 1 followed.

## **22. Cable Joints**

If several different types of joint are to be provided, the various types, e.g. through, breaches and tee, should be shown on the Drawings, cross-referenced in Appendix 14/4 including cable sizes for both main and branch cables.

Provision of joints not shown on the Drawings is generally unacceptable. Shortage of cable through incorrect measurement, wilful or accidental cable damage, should not be considered as justification for additional joints.

Jointing should be carried out under adequate supervision and comply with BS 6910-2. In establishing evidence of the joiner's competence, whether the joiner has recently attended a recognised course and his length of experience should be considered. If there are any doubts on the competence of a joiner, a sample joint should be required from the joiner prior to commencement of the work.

## **23. Armoured Cable Terminations**

Not Used.

## **24. Inspection and Testing to be Carried Out by the Contractor**

The use of methods of testing other than those given by ET 101: National Rules for Electrical Installations are not precluded provided they give no less effective results.

An acceptable test of cable sheath insulation is provided by the application of 1000 V from an insulation tester.

The Employer's Representative requires a certificate from the Contractor verifying compliance with the ET 101: National Rules for Electrical Installations maintained by the National Standards Authority of Ireland, including all test results should form part of the completed documentation and shall be forwarded by the Contractor to the Employers Representative along with other site records.

## **25. Preparation and Finish of Metal and Other Surfaces**

Not Used.



## NG SAMPLE APPENDIX 14/1: SITE RECORDS

*[Note to compiler: Include as appropriate:]*

*As-built drawings shall be produced by the Contractor, on.....number copies of drawing no.....which will be provided by the Employer's Representative/on.....number copies of general arrangement drawings which shall be produced by the Contractor and shall be in accordance with the requirements of CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 2. The record drawings shall be produced on CAD/CD ROM/other medium.*

*Motorway communications details shall/shall not be included on the drawings.*

*The Contractor shall also supply test certificates cross-referenced to the apparatus identified on the as-built drawings.*

*The Contractor shall supply Operations and Maintenance manuals to support the site records. [Include any additional requirements for site records] [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 2]*

*The Contractor shall provide site records that include as a minimum the following information:*

- i. Foundation Details;*
- ii. Column locations, numbered uniquely, including column type and manufacturer;*
- iii. Column mounting heights and setbacks;*
- iv. Bracket manufacturer, outreach & tilt (if a bracket is used);*
- v. Details of proposed lanterns including manufacturer, model, constant light output wattage (where applicable), lux switch on/off levels of photocell (where applicable), number of LEDs in lantern (where applicable), klm output, Correlated Colour Temperature (CCT) and lantern tilt;*
- vi. The routes and locations of all public lighting ducts (including road crossings), Public lighting cable chamber locations;*
- vii. Public lighting and ESB Network feeder pillar locations;*
- viii. Overhead Power Line locations;*
- ix. Public lighting circuit schematics, together with comprehensive legend and installation notes; and;*
- x. Details of ESB Networks supply points.*

*As Built Drawings shall be provided to the following scale [state scale].*

*A maintenance method statement shall be provided in respect of lighting columns that are not accessible from the public road or where vehicular access is limited or likely to be problematic.*

## NG SAMPLE APPENDIX 14/2: LOCATION OF LIGHTING UNITS AND FEEDER PILLARS

*[Note to compiler: Include either:]*

*The position and description of Lighting Units, feeder pillars and electrical isolation pillars are shown on the following drawings.....[ CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 3]*

*[or:]*

*The position and description of Lighting Units, feeder pillars and electrical isolation pillars are scheduled below:*

Description of Equipment	Location of Equipment

*[Notes to compiler:*

1. *Information on the design of road lighting in accordance with BS 5489-1 may be included.*
2. *The various types of Lighting Unit will call for different location dimensions and descriptions. Both position and description entries may be divided into normal and special categories for drawings or schedules.*
3. *Prior agreement is required with the Employer's Representative to the position and description of the electrical isolation pillars [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 1]. This should only be required in exceptional circumstances such as isolated lighting installations at rural roundabouts where the cost of separate power supplies to lighting on third party roads could be prohibitively expensive.]*

## NG SAMPLE APPENDIX 14/3: TEMPORARY LIGHTING

*[Note to compiler: Include here:]*

- i. *The requirements for any temporary lighting. [For example, for traffic management during temporary diversions for traffic, and at central reserve crossovers.] [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 5]*
- ii. *The requirements for any advance fixed Road Lighting Units, [in final positions as far as practicable] to fulfil the requirements of i.*

*The Contractor shall ensure that the temporary lighting is provided in accordance with BS5489-1*

# NG SAMPLE APPENDIX 14/4: ELECTRICAL EQUIPMENT FOR ROAD LIGHTING

The Contractor shall insert below details of the equipment which he proposes to use in the Works and shall submit the information as soon as the Contract has been awarded.

## 1. Luminaires, Lamps and Light Sources

The luminaires shall be compatible with the columns and brackets offered in Appendix 13/2 and the information shall include the lamp type and wattage and luminaire circuit wattage.

[The compiler should state here any particular requirements described in CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 7. For example: luminaire design attitude, luminaire (glare control) classification, IP (Ingress Protection) enclosure rating, any exclusion of PECU sockets, mounting height (nominal), ratings of fuses in integral gear compartments.] [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Sections 1 and 2.....]

Manufacturer	Cat. No.	Glare Control		IP Rating		PECU Socket (NEMA or SR)	(Design Table Ref. No.)*
		Luminous Intensity Class	Glare Index Class	Optical Housing	Control Gear Housing		

[\*If required, to ensure the assembly of Road Lighting Units conforms to the performance requirements of IS EN 13201-2.]

## 2. Ancillary Equipment

[Note to compiler: Include here:]

- i. The positioning of equipment described in CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Sections 11 to 17 within the base compartment of columns
- ii. Requirements for wiring and installation of components within columns [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 19].
- iii. Requirements for group switching [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 13].
- iv. Requirement for and location of shorting plug where lanterns are a pair mounted on twin arm brackets [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 13].

Section	Item	Manufacturer	Catalogue or Type No	Requirements [Compiler to complete]
10	LED Drivers			Driver Current
11	CMS			
12	Dimming			Profiles
13	Photo-electric control units			Differential and switching levels (If required)
	Shorting plug			
14	Time Switches			
15.1	Ballasts			
15.2	Ignitors			
16	Cut-outs			Current Rating
	Fuse Holders			
	Fuse Links			
	MCBs			MCB class
19	Wiring			Conductor Size

### 3. Feeder Pillars

Feeder pillars shall be suitable for the layouts shown on drawing nos..... and conform with the requirements shown on the Drawings and in the following list.

[See also CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Sections 18 and 19]

[The compiler should state here:]

- i. Any particular requirements for hinges, locks, keys, circuit details, earth electrodes.

Location of Feeder Pillar	Manufacturer	Catalogue No.

### 4. Cables and Cable Joints

[The compiler should state here:]

- i. References to drawings which show requirements for the installation of cable covers [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 21].
- ii. Reference to drawings which show cable lines, cable joints and cable joint marker blocks [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Sections 21 and 22].
- iii. Particular requirements for cable laying, additional protection and support [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 21].
- iv. Requirement for cables following the same route if different from the requirement of CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 21.
- v. Requirements for installation of power supply cables adjacent to communication cables if different from the requirements of CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 21.

- vi. Reference to drawings which show identifying marks to be indented in permanent marker blocks [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 21]. [Cross-reference should be made to HCD drawing no. I1 where appropriate].
- vii. Requirements for terminating armoured cables [CC-SPW-01400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 23].

<b>Location of (a) Cables (b) Cable Joints</b>	<b>Manufacturer</b>	<b>Catalogue No. Reference No. or Name of Cable</b>

#### 5. Preparation and Finish of Metal and Other Surfaces

[The compiler should state here:]

- i. Electrical components and ancillary equipment preparation and finish.

## NG SAMPLE APPENDIX 14/5: ELECTRICAL EQUIPMENT FOR TRAFFIC SIGNS


*[Note to compiler: Include here:]*

- i. IS EN 12899-1 luminance & uniformity requirements as described in [CC-SPW—1400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 8]*
- ii. The positioning of electrical equipment for traffic signs described in Sections X, Y & Z within the base compartment of posts described in. [CC-SPW—1400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 17]*
- iii. Requirements for wiring and installation of components within posts and Lit sign units described in [CC-SPW—1400 – Specification for Electrical Work for Road Lighting and Traffic Signs – Section 19]*







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